

Name: _____

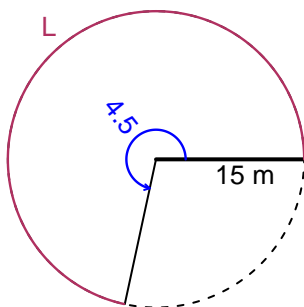
Date: _____

Trig Final (SLTN v644)

- You can use a calculator (like [Desmos](#))
- You should have a unit-circle with special angles and coordinates marked.

Question 1

In the figure below, we see a circle and a central angle that subtends an arc. The angle measure is 4.5 radians. The radius is 15 meters. How long is the arc in meters?

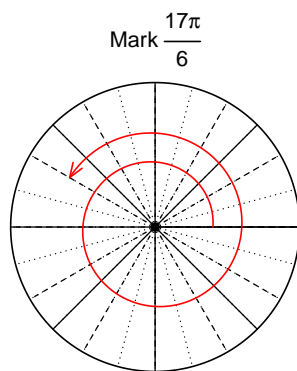


$$\theta = \frac{L}{r} \quad r = \frac{L}{\theta} \quad L = r\theta$$

$L = 67.5$ meters.

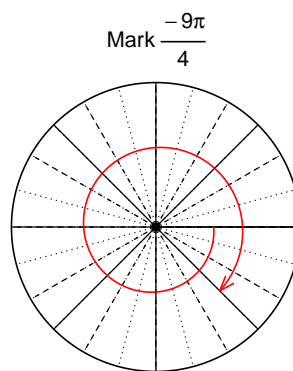
Question 2

Consider angles $\frac{17\pi}{6}$ and $\frac{-9\pi}{4}$. For each angle, use a spiral with an arrow head to **mark** the angle on a circle below in standard position. Then, find **exact** expressions for $\sin\left(\frac{17\pi}{6}\right)$ and $\cos\left(\frac{-9\pi}{4}\right)$ by using a unit circle (provided separately).



Find $\sin(17\pi/6)$

$$\sin(17\pi/6) = \frac{1}{2}$$



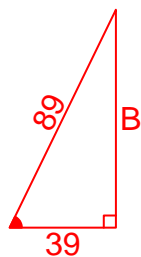
Find $\cos(-9\pi/4)$

$$\cos(-9\pi/4) = \frac{\sqrt{2}}{2}$$

Question 3

If $\cos(\theta) = \frac{-39}{89}$, and θ is in quadrant III, determine an exact value for $\tan(\theta)$.

Ignore any negatives and the quadrant, and draw a right triangle (based on SOHCAHTOA) in standard (quadrant I) orientation.



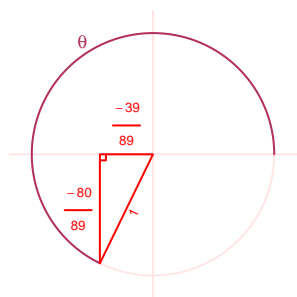
Solve the Pythagorean Equation

$$39^2 + B^2 = 89^2$$

$$B = \sqrt{89^2 - 39^2}$$

$$B = 80$$

Rescale the triangle so the hypotenuse is 1. Reflect the triangle into Quadrant III in a unit circle.



$$\tan(\theta) = \frac{\frac{-80}{89}}{\frac{-39}{89}} = \frac{80}{39}$$

Question 4

A mass-spring system oscillates vertically with a midline at $y = -6.43$ meters, a frequency of 4.48 Hz, and an amplitude of 2.79 meters. At $t = 0$, the mass is at the maximum height. Write an equation to model the height (y in meters) as a function of time (t in seconds).

Any of these equations would get full credit.

$$y = 2.79 \cos(2\pi 4.48t) - 6.43$$

or

$$y = 2.79 \cos(8.96\pi t) - 6.43$$

or

$$y = 2.79 \cos(28.15t) - 6.43$$